(E) to be on average 4.2×10^5 dynes per cm.² in dogs. Clark (1933), working on the excised veins of dogs, found E for veins at a pressure of 3–4 cm. of mercury to be 4.2×10^5 dynes per cm.²

Despite this obvious comparison, no previous author has precisely maintained that the resting C.S.F. pressure is dependent mainly on the pressure exerted by the elasticity of intradural veins. It must be emphasized, however, that the resting C.S.F. pressure represents an average of the pressures of all the intradural vessels, including arteries. Because there are many more veins than arteries, two conclusions follow. First, although C.S.F. pressure is higher than venous pressure, it approximates far more nearly to venous than to arterial pressure; secondly, given the inelasticity of dura and central nervous axis, the coefficient of elasticity of the total intradural contents will approximate very nearly to that of the veins alone.

To increase the C.S.F. pressure for experimental purposes Weed and his collaborators have used almost exclusively the method of vertical tilting. By this method, with the manometer open to the air, the pressure recorded must be equal to the hydrostatic pressure of a column of C.S.F. from the needle to the highest point of the intradural space, plus or minus the effects of elasticity and/or collapse of the intradural vessels, as has been pointed out by Merritt and Fremont-Smith (1937). The present paper is concerned with the rise in "pressure" brought about by the various techniques of venous compression; or, rather, techniques which divert blood from the caval to the intradural veins. Weed (1922), in his classical experiments on decrease of C.S.F. pressure by the intravenous injection of hypertonic saline, noted that, although hypertonic saline eventually reduced the pressure considerably (even to negative values), during the time of injection there was a rise of C.S.F. pressure. This can have been due only to increased venous volume. Stookey (1924) realized the importance of venous dilatation when he stated that a rise of C.S.F. pressure on straining was probably due to a temporary block of venous outflow from the cranial cavity and vertebral canal; though, of course, as Batson (1940) has shown, it is a diversion of blood into the vertebral veins rather than a blockage of outflow that occurs.

Weed and Flexner (1933), referring again to tilting experiments, state: "With the experimental increase of cerebrospinal pressure brought about by the introduction of fluid into the subarachnoid space, a certain diminution of intradural venous volume must follow; but the pressure in these cerebral veins remains unaltered. Conversely, when the pressure of cerebrospinal fluid is reduced mechanically or by tilting, the cerebral venous bed apparently compensates by dilatation, the venous walls expanding and permitting an increase of intradural venous volume, though maintaining in these expanded channels the same pressures." It requires only a short step from this, aided by the work of Ryder, Molle, and Ferris (1944), showing that veins do in fact dilate without increase of pressure, to the hypothesis put forward in the present paper—namely, that, owing to diversion of blood from the caval to the extradural and intradural vertebral venous system, the intradural veins do in fact dilate without increase of pressure, and thus volumetrically displace a corresponding amount of C.S.F.

Summary

There has been a fundamental misconception with regard to spinal manometry; Boyle's law of gas pressure does not apply to liquids.

It is suggested that the resting pressure of the C.S.F. is due to the pressure transmitted from the walls of blood vessels within the spinal and cranial subarachnoid space.

Rise of "pressure" above the physiological norm is thought to be due to the increase in volume, without

rise of pressure, of the veins within the subarachnoid space which displace an equal volume of C.S.F. into the manometer.

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TRANSVERSE ARREST OF HEAD AND THE OCCIPITO-POSTERIOR POSITION

BY

BRYAN WILLIAMS, M.D., F.R.C.S.Ed., F.R.C.O.G.

Senior Obstetrician and Gynaecologist, Middlesbrough Maternity Hospital and North Ormesby Hospital

The occipito-posterior position is generally thought to be a common cause of difficult and prolonged labour, carrying a high risk to mother and baby, causing much worry to midwife and doctor, and often ending in a difficult instrumental delivery. Evidence is presented, however, that these risks and difficulties have been greatly overestimated in those cases in which the occiput is found posteriorly late in labour, or the true persistent occipito-posterior positions. On the other hand, if the occiput fails to rotate anteriorly from a lateral position there is serious foetal risk and often great difficulty in operative delivery. It is these cases which have given the occipito-posterior position its bad reputation, as they are usually looked upon as posterior positions in which incomplete rotation has occurred. It is probable, however, that in most of them the head has been lying transversely throughout labour, and to describe them as occipito-posterior positions is therefore incorrect. The methods of operative delivery, moreover, differ in the two complications, and it now seems desirable to separate transverse arrest of the head from the persistent occipito-posterior position.

Incidence

The figures given in the literature for the incidence of the occipito-posterior position vary widely, and this is doubtless due to the differing times in pregnancy or labour at which examination has been made and to varying criteria of diagnosis. Munro Kerr and Chassar Moir (1949) have also pointed out the importance in this respect of the incidence of abnormal pelvic types in the material studied.

In practice, however, it is important to know the proportion of cases in which anterior rotation of the head fails with conservative midwifery, and also the exact position of the head in these cases. Such figures have been obtained from the records of Walton Hospital, Liverpool, for the year 1937, and are given in Table I. This gives the posi-

TABLE I.—Incidence, Method of Delivery, and Results of Transverse Arrest of the Head and the Persistent Occipito-posterior Position in 2,958 Labours

	Transverse Arrest	Persistent Occipito-posterior Positions
Total No. of babies ..	54 (38 primigravidae, 16 multigravidae)	53 (22 primigravidae, 31 multigravidae)
Method of delivery:		
Caesarean section ..	5	2
Manual rotation, forceps ..	21	2 (spontaneous rotation in 1 case)
Forceps ..	17	8 (face-to-pubes)
Craniotomy ..	5	0
Normal delivery ..	6 (head transverse)	41 (face-to-pubes)
Results:		
Maternal mortality ..	0	0
Maternal morbidity ..	11 (20%)	1 (2%)
Foetal mortality ..	13 (24%)	9 (17%)

tion of the vertex in these cases at the time of delivery or intervention, together with the method of delivery and the results to mother and baby. In that year great attention was paid to accurate diagnosis of position, and diagrams were often drawn in the records. A few cases are excluded in which a caesarean section was done for disproportion and in which the exact position of the head was not noted. It is probable that in these cases transverse positions of the head were more common than occipito-posterior positions.

The figures in Table I show that transverse arrest is more common in primigravidae and that operative delivery is always required, except in a few cases in which spontaneous delivery of a transverse head occurs, and in these the baby is usually small. The true occipito-posterior position, on the other hand, is more common in multigravidae and spontaneous delivery is frequent. The greater incidence of difficult labour and intervention in transverse arrest is reflected in a higher morbidity rate. Although there is no marked difference in the figures for the combined stillbirths and neonatal deaths, analysis of the causes of these, however, shows that in transverse arrest at least 11 out of 13 deaths were due to complications of labour, whereas in the persistent occipito-posterior position 8 out of 9 deaths were due to developmental abnormality or prematurity. The craniotomies were all carried out on dead babies, and two of them were in "failed forceps" cases.

In Table II the forceps deliveries in the same year are classified according to the position of the head at the time of interference. These figures show that with conservative

TABLE II.—Position of Head in 172 Forceps Deliveries

	Anterior Positions	Transverse Arrest	Persistent Occipito-posterior Positions
Total ..	124 (72%) (including 1 mento-anterior position)	38 (22%)	10 (6%)
Maternal mortality	2 (1.6%) (heart disease; pulmonary tuberculosis)	0	0
Maternal morbidity	18 (14.5%)	7 (18.5%)	0
Foetal mortality	11 (9%)	7 (18.5%)	0

Incidence of forceps delivery, 5.8%.

midwifery transverse arrest of the head is a more frequent indication for forceps delivery than the persistent occipito-posterior position, and that such delivery has a much higher risk for mother and baby.

As the number of cases of the persistent occipito-posterior position delivered with forceps in one year was small it seemed advisable to review a larger series to determine the risks to mother and baby, and Table III shows

TABLE III.—Results in 63 Face-to-pubes Deliveries with Forceps

	Primigravidae	Multigravidae	Total
No. of cases ..	55	8	63
Maternal mortality	2 (both from shock following manual removal of the placenta and pregnancy toxæmia)	0	2 (3%)
Maternal morbidity	3	0	3 (5%)
Foetal mortality ..	1 (tentorial tear)	3 (hydrocephalus; prolapse of cord, baby 3½ lb. (1.6 kg.); asphyxia, baby 10½ lb. (4.8 kg.))	4 (6%)

the results in 63 patients delivered in the course of six years, from 1936 to 1941 inclusive, with forceps in the face-to-pubes position. These figures show the striking fact that in 55 primigravidae there was only a single foetal death, and do not support the view usually held that this method of delivery has a high risk for the baby.

The problem of the non-rotated head, therefore, is seen to be mainly that of the transversely arrested head and not that of the persistent occipito-posterior position. The former demands intervention more often, and delivery is usually difficult and carries a high foetal risk.

Mechanism of Transverse Arrest

Transverse arrest of the head is a complication familiar to all obstetricians and was well described by Smellie. While American and Continental obstetricians lay stress on it, however, it receives inadequate attention in this country, and it is usually looked upon as a stage in the mechanism of the occipito-posterior position. This is doubtless the result of the standard teaching that the head normally enters the brim in one of the oblique diameters, and the transverse head is therefore considered to be an occipito-posterior position in which partial rotation has occurred.

There has long been clinical evidence, however, also going back to the time of Smellie, and referred to by Munro Kerr and Chassar Moir, that the head most commonly engages in the transverse diameter of the brim. The terms "occipito-lateral" and "occipito-transverse" are in common use. Radiological evidence now supports these clinical findings. Caldwell, Moloy, and D'Esopo (1934) showed that the head entered the brim transversely in 60% of their cases, and Steele and Javert (1942) found a slightly higher percentage of transverse heads both at the brim and in the cavity of the pelvis. Clinical observation shows that in those cases in which transverse arrest occurs the head has been transverse throughout labour. It seems inaccurate, therefore, to describe these cases as persistent occipito-posterior positions, and it is better to separate them from the true occipito-posterior positions.

The adjective "deep" is commonly used in connexion with transverse arrest. This term presumably refers to the depth inwards from the pelvic outlet at which arrest occurs rather than to the depth downwards from the pelvic brim. While arrest is most common in the pelvic cavity it may take place at any level, and as the term seems to have little value its use might be discontinued, as also might the use of inverted commas with the words "transverse arrest."

In face presentation a similar problem may arise, though such cases are infrequent. The figures for the incidence of the various positions in face presentation are often confused

by the inclusion of cases of anencephaly, in which the position of the chin is of no importance. The so-called persistent mento-posterior position is usually a transverse arrest of the face, and might well be included under the heading of "transverse arrest of the head."

Diagnosis

The signs of the non-rotated head have been well described by Douglas Miller (1930). Early in labour the occipito-lateral and occipito-posterior positions can usually be differentiated by abdominal examination. In the occipito-lateral position the smooth back will be felt in one flank with the anterior shoulder some way out from the midline, limbs will not be prominent, the foetal heart sounds will be heard on the same side as that on which the back is found and will usually be faint, and the forehead will be felt well laterally till a late state of labour. In the occipito-posterior position there is a characteristic flattening or even a depression above the symphysis, the back and anterior shoulders are well out posteriorly with limbs easily felt on the opposite side and sometimes showing active movements, and the foetal heart sounds will be heard either well out in the flank and faintly or nearer the midline and more loudly.

Although in most cases the position of the head may be diagnosed from that of the back and vice versa, there is occasionally much twisting of the neck in labour. This has been found radiologically by Hedley (1932), and by Munro Kerr and Chassar Moir. In two remarkable cases reported by Smith (1949) much untwisting of the neck had to be carried out before delivery could be effected with forceps.

Vaginal examination is rarely called for early in labour, and later on the ease with which the classical features of the sutures and fontanelles can be recognized will depend on the extent of caput formation. It is often advised that before any intervention is carried out a final diagnosis of position should be made by palpation of the ears and face. This, however, needs deep general anaesthesia, and a degree of manipulation that is undesirable, and should be unnecessary, in a case followed throughout labour. Useful diagnostic features not often stressed are the characteristic feel of the external occipital protuberance and the saw-like edges of the parietal bone commonly found in the region of the posterior fontanelle.

In the real occipito-sacral position when the head is low and well moulded the incorrect diagnosis of a fully rotated occipito-anterior position is easily made. This mistake is due to the sagittal suture being found in the midline and to the frontal suture being inconspicuous. If forceps are applied the blades lie easily on the sides of the head, though early perineal distension on traction should make one suspect the accuracy of the diagnosis. The mistake, fortunately, is not a serious one, as will be shown later, but it can usually be avoided by careful abdominal examination.

In those cases in which the head has entered the pelvis but has failed to reach the perineum after an adequate period of good contractions it will usually be correct to assume that transverse arrest has taken place. In patients seen for the first time later in labour an exact diagnosis of position by clinical methods is often difficult. Abdominal examination in a restless patient may be inconclusive, and a ring is often present and the uterus tightly moulded round the foetus. A large caput may obscure the usual landmarks looked for on vaginal examination.

Facilities for intra-partum x-ray examination of such cases should now be available in maternity units, and this method of investigation will also be of great help in deciding the best technique of delivery. Otherwise examination under general anaesthesia with all its disadvantages may be necessary, and even then an exact diagnosis of position may be impossible. Early in labour, however, an accurate diagnosis by ordinary clinical methods will rarely be difficult.

Treatment

There has long been clinical evidence that deformities of the pelvic outlet in particular are commonly associated with defective rotation of the head (Plass, 1916). In recent years the extended use of x-ray examination has greatly increased our knowledge of the mechanism of labour in both normal and abnormal pelves. Caldwell and Moloy (1938) showed the importance of basing the method of operative delivery on the type of pelvic abnormality present as shown by stereoscopic radiological studies, and they found, moreover, that these studies decreased the incidence of difficult forceps delivery. The importance of uterine action, and the resistance of the soft parts, however, is shown by the fact that normal delivery may take place, and, indeed, is usual in subsequent labours, although intervention has been necessary for transverse arrest in the first one.

The incidence of mid-forceps operations can nowadays be greatly reduced by the extended use of caesarean section with an improvement in foetal mortality and a decrease of maternal injuries. Nevertheless the minor degrees of pelvic deformity still present difficulties in treatment, and a small number of cases of mid-cavity arrest will occur with conservative practice. Among the most disappointing cases in obstetrical practice are those in which, in spite of good antenatal care, slow and difficult labour occurs as a result of the combination of inertia, slow dilatation, minor pelvic contraction, and delayed rotation of the head. If labour is allowed to continue unduly in the hope that spontaneous delivery, or at any rate a low forceps delivery, will be possible the optimum time for abdominal delivery may be passed, and the difficulty of extracting the foetus by lower-segment caesarean section is then great and the risk to the baby therefore high. In such cases the use of x-ray examination during labour, if it has not been carried out before, is of great help.

The method of delivery of the non-rotated head still gives rise to much controversy. The technique usually advised is that of manual rotation followed by the application of forceps. It is probable, however, that manual rotation is still advised too lightly and that its difficulties and dangers are underestimated. It may be very easy in a multigravida with a deficient perineum to rotate the head through two right angles and to complete delivery with forceps. In such cases the failure of rotation is due to deficiency of the pelvic floor or perhaps to some other factor such as deflexion of the head by an arm under the chin or to increased extensor tone in the neck muscles.

In a primigravida with a transversely arrested head, however, the problem is different. The outlet is usually narrow, and manipulations are difficult. Failure of rotation is due to the head having failed to reach the pelvic floor. Rotation at the level of arrest cannot take place, and in most cases the manipulation is inadvisable and should not be attempted. Caldwell and Moloy have shown the risks of attempts at anterior rotation in certain types of pelvis, and this has been supported more recently by Williams and Arthure (1949) as a result of their radiological studies of the pelvic outlet.

In considering the technique of delivery it becomes important to distinguish between the transversely arrested head and the persistent occipito-posterior position. The former should be delivered as an occipito-anterior position, while the latter should in most cases be delivered in the face-to-pubes position. Occasionally spontaneous delivery of a small head may occur in the transverse position, as shown in Table I, and this receives little mention in the textbooks. Irving Potter (1928) has also recommended deliberate delivery of the head in the transverse position when carrying out forceps delivery in order to save the perineum. Nevertheless it is usually agreed that delivery should be effected with the head fully rotated, and if forceps traction alone without any other manoeuvre is carried out spontaneous rotation will nearly always occur.

In view of the attention which is always paid to manual rotation it must be emphasized that the trouble is not failure of rotation but failure of the head to reach the level of the pelvis at which rotation normally occurs. Manual rotation is therefore not only impossible in most cases but attempts to carry it out may increase the risk to the foetus and need deep anaesthesia and much manipulation. In many of the cases in which it is thought to have been successful the position of the forceps marks on the baby's head will show that the blades have been applied to a more or less transverse head.

The pelvic application of the classical forceps with the use of axis traction is commonly employed in these cases. This involves an unsatisfactory grip with one blade over the forehead and carries a high risk of tentorial tears and eye injuries. The use of the Kielland forceps in this type of case is very satisfactory and is now widely recommended. The classical method of rotating the anterior blade of this instrument inside the uterus cannot, however, be free from risk either to the baby or to the uterus and anterior vaginal wall, and is nowadays unnecessary. This blade can be passed into position over the face by a wandering, gliding, or migratory movement. Sometimes the anterior blade is easy to apply and the posterior one difficult, and sometimes the reverse is found. Study on the manikin and considerable practice are required, and even then it is occasionally difficult to obtain a perfect cephalic application. Deep general anaesthesia is unnecessary and the instrument may be applied with only two fingers in the vagina. Spontaneous rotation usually occurs as the head reaches the pelvic floor, but this may be aided with the forceps.

The Kielland forceps is no more or no less dangerous than any other one. The application of forceps to the non-rotated head should be carried out only by those of experience, and all who practise obstetrics should master the use of the Kielland forceps. The exact diagnosis of position and the careful following of the proper mechanisms of labour which are both necessary with this instrument are perhaps largely responsible for its success. In skilled hands, as pointed out by Caldwell and Moloy, good results may be obtained by other methods and other instruments. In America a few authors have written enthusiastically of the Barton forceps, which has a hinged anterior blade and gives a cephalic grip of the transverse head. Some obstetricians recommend a cephalic application of the classical forceps. Nevertheless the delivery of a transversely arrested head with the Kielland forceps provides nowadays one of the most satisfactory experiences in obstetrics.

The type of anaesthetic needed will depend largely on the operative procedure. For manual rotation general anaesthesia of some depth is necessary, with all its disadvantages to mother and baby. The application of the Kielland forceps, however, may be carried out under some form of conduction anaesthesia, such as spinal anaesthesia. Although there has been much discussion about the risks of spinal anaesthesia for caesarean section there is little dispute over its safety for vaginal delivery, and it has been warmly advised in recent years by several authors in this country. Anderson (1946) has particularly recommended its use for difficult forceps deliveries. The records of 3,000 obstetrical cases in which spinal anaesthesia was used in Walton Hospital in 11 years up to the end of 1946 show that, although two deaths followed its use for caesarean section, there were no deaths or major complications due to its use for vaginal delivery. Its only serious disadvantage is the occasional occurrence of troublesome headache, though there is some evidence that the use of a very fine needle to puncture the theca may greatly reduce the incidence of this distressing complication. For the delivery of the non-rotated head a rather bigger dose is required than is necessary for perineal anaesthesia. This method of anaesthesia is so safe for mother and baby and so satisfactory to the obstetrician that it should now no longer

be considered to be on trial, but it is rather the continued use of general anaesthesia which should be justified for difficult forceps deliveries.

In face presentation the anomalies of rotation are similar to those of vertex presentation, and the so-called "persistent mento-posterior position" is usually a "transverse arrest of the face." The true mento-posterior position is rare, and differs from the persistent occipito-posterior position in that delivery with the chin posteriorly, either spontaneously or with forceps, must be exceptional, and caesarean section will usually be needed for it. The same treatment is required for transverse arrest of the face as for transverse arrest of the vertex, and the Kielland forceps is also valuable, in these cases. One point of distinction, however, between face and vertex presentations which is not emphasized enough is that in face presentation the caput may involve the upper air passages and cause increased foetal risk from pulmonary and feeding complications, and a less expectant attitude than in vertex presentations is therefore advisable.

In *occipito-posterior* positions the desirability of manual rotation has also been overemphasized. In practice many face-to-pubes deliveries are carried out with forceps in cases in which the correct diagnosis of position is not made until the appearance of the face from under the pubes causes discomfiture to the obstetrician. When the head is low and well moulded manual rotation should not be attempted, and its dangers here also have been shown by Caldwell and Moloy. This position is often found with the anthropoid pelvis, which is an efficient type of pelvis, and a deliberate face-to-pubes delivery does not usually present great difficulties if the normal mechanism is followed, though there is undoubtedly a great risk of lacerations, and extensive episiotomy is often necessary. The figures given in Table III show that there was only a single foetal death from cerebral haemorrhage in 55 primigravidae delivered with forceps as face-to-pubes cases. It would seem, therefore, that forceps delivery in the occipito-posterior position is no more dangerous than in the occipito-anterior position, and this is doubtless due to the forceps blades lying easily on the sides of the head and causing no stretching of the tentorium.

The presentation of a slightly bigger diameter has been traditionally put forward as the explanation of the difficulty with delivery of the occipito-posterior position, but a more reasonable one is the theory advanced by Chassar Moir (1938) of the maladjustment of the foetal and pelvic curves. The same idea is found in the "pivot points" theory of Buchanan (1920) and demonstrated by his very ingenious models.

The high incidence of easy spontaneous delivery and the low foetal risk of face-to-pubes delivery with forceps in occipito-posterior positions are in contrast with the findings in transverse arrest of the head, and it seems advisable, therefore, to consider these two forms of the non-rotated head separately. In both complications, however, a fascinating opportunity for the exercise of obstetrical judgment and skill is offered, especially with the rare need nowadays for axis traction and with our increased knowledge of the mechanism of labour obtained from radiological studies.

Summary

The head is usually found to be transversely arrested in cases of the so-called persistent occipito-posterior position which give rise to difficulty in labour. Transverse arrest of the head is not a stage in the mechanism of the occipito-posterior position, and the two conditions should be separated.

A cephalic application of forceps and traction without rotation is the best treatment for the transversely arrested head, and the Kielland forceps is very suitable for this purpose.

In the true occipito-posterior position a deliberate face-to-pubes delivery with forceps is usually indicated when the head is low, and this has a small foetal risk.

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SUBARACHNOID HAEMORRHAGE IN PREGNANCY

BY

JOHN N. WALTON, M.D., M.R.C.P.

(From the Department of Medicine, King's College,
University of Durham, and the Royal Victoria Infirmary,
Newcastle-upon-Tyne)

Since Lazard (1899) reported a case of cerebral haemorrhage arising during labour, many authors have described spontaneous intracranial haemorrhage occurring during pregnancy. Cerebral haemorrhage, often with extension to the subarachnoid space, has been noted in patients with eclampsia (King, 1933; de Carle, 1949) and toxæmia (Masten, 1935; Strauss and Tarachow, 1937), and these observations have inspired the view that generalized vascular changes are usually responsible for subarachnoid haemorrhage in pregnancy, labour, or the puerperium (Dahle, 1946). While this is true of many cases it is now evident that subarachnoid haemorrhage of aneurysmal or angioma origin is an occasional complication of an otherwise normal pregnancy.

Of the 312 cases of spontaneous subarachnoid haemorrhage reported elsewhere (Walton, 1952a), two occurred during pregnancy; these cases are here reported in detail.

Case 74

A housewife aged 35 was admitted to the Royal Victoria Infirmary under the care of Professor F. J. Nattrass on January 27, 1948. Six years previously she had had an illness which began with sudden headache and prostration, and she spent three weeks in an isolation hospital, with a diagnosis of meningitis. For several months afterwards she had occasional headaches. On the day before admission, when in the thirtieth week of her first pregnancy, she was straining at stool, when a bursting frontal headache developed; this was followed by a generalized epileptic fit and a period of unresponsiveness lasting twenty minutes.

On examination on admission, twenty-four hours later, she was rational though drowsy and irritable; there was moderate neck stiffness, but no other abnormal signs were found in the central nervous system. The pulse was 60 a minute, blood pressure 140/90 mm. Hg, and temperature 99.2° F. (37.3° C.). Lumbar puncture revealed a deeply blood-stained fluid under a pressure of 200 mm., and the supernatant fluid was bright yellow. The urine contained small amounts of albumin and sugar.

The patient improved steadily and was transferred to the Princess Mary Maternity Hospital on February 13; she came into spontaneous labour on April 10 and was delivered of a healthy baby. Labour and the puerperium were uneventful. Although troubled for some months by headaches and anxiety symptoms, she is now living a normal life.

Comment.—The illness suffered by this patient six years previously was probably subarachnoid haemorrhage. In the absence of signs of toxæmia it is likely that both attacks arose from rupture of an intracranial aneurysm or angioma. There is no evidence that pregnancy was related to the haemorrhage, and normal labour did not provoke a recurrence of bleeding.

Case 273

A housewife aged 40 was admitted to the Princess Mary Maternity Hospital on October 25, 1942, for investigation. Three days previously, while in the twenty-sixth week of her third pregnancy, she was found to have albuminuria. Her blood pressure was normal and she had no symptoms. Shortly after admission she suddenly became confused and irrational; two hours later a generalized epileptic convulsion occurred, she became comatose, and neck stiffness was noted. She was transferred to the Royal Victoria Infirmary under the care of Dr. F. J. Nattrass three hours later.

On examination she was comatose, with Cheyne-Stokes respiration. The pulse was 68 a minute, blood pressure 140/90 mm. Hg, and temperature 100° F. (37.8° C.). There was severe neck stiffness and Kernig's sign was positive. A large subhyaloid haemorrhage was seen in the right eye; the retinal veins were engorged and small flame-shaped haemorrhages were seen in both retinae, but there was no papilloedema or any evidence of arteriopathy. The pupils were widely dilated and non-reacting; all four limbs were flaccid, and the left plantar response was extensor.

Lumbar puncture five hours after the ictus revealed deeply blood-stained fluid under high pressure; the supernatant fluid was faintly yellow. The urine contained a considerable quantity of albumin but no sugar. The patient deteriorated, and died eight hours after the onset.

At necropsy the following day much blood was seen in the basal cisterns and cerebral sulci. A ruptured aneurysm, 0.5 by 0.5 cm. in diameter, was found at the junction of the left anterior cerebral artery with the anterior communicating. The corpus callosum was ploughed up and haemorrhage had entered the right frontal lobe, reaching the lateral ventricle. Histological examination of the renal and cerebral vasculature showed no evidence of acute vascular pathology. The hepatic parenchyma was also normal on section. A normally formed six-months foetus was found *in utero*.

Comment.—Although albuminuria was noted before subarachnoid haemorrhage developed, there was no clinical or pathological evidence of toxæmia, and the necropsy findings were such as are commonly seen in non-pregnant patients with ruptured intracranial aneurysms; it cannot be suggested with any authority that the coexistence of pregnancy provoked the haemorrhage or influenced the outcome.

Discussion

Clinically typical attacks of spontaneous subarachnoid haemorrhage complicating normal pregnancies have been reported by Sands (1929, 1 case), Russel (1933, 1 case), Moskowitz and Schneider (1938, 3 cases), Richardson and Hyland (1941, 3 cases), Dahle (1946, 1 case), Rhoads (1947, 2 cases), Hamby (1948, 4 cases), Garber and Maier (1948, 3 cases), Ramstad (1948, 1 case), Olivecrona and Riives (1948, 1 case), de Carle (1949, 3 cases), Bell (1949, 2 cases), Gershenfeld and Savel (1950, 1 case), Ask-Upmark and Ingvar (1950, 2 cases), and Conley and Rand (1951, 8 cases). This complication may pose important problems of management, and, as Mackenzie (1933) has pointed out, diagnostic difficulties may arise, since hypothalamic irritation by subarachnoid blood may produce hypertension and albuminuria. If these signs are discovered in a comatose patient a misdiagnosis of eclampsia is possible, particularly if no search is made for signs of meningeal irritation. Even in a confirmed case of subarachnoid haemorrhage it may be difficult to be sure that toxæmia has not played some part in the aetiology (Conley and Rand, 1951). However, many